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Introduction

Adaptive Learning Systems [ALS] have been proposed as a new approach for analyzing, designing and implementing complex software systems [Jennings et al., 1998]. Although varied in description, these systems are characterized by behaviors that are adaptable (by self-automation of actions) and flexible (by learning the user's preferences, styles, and cognitive levels thereby offering proactive forms of interaction/support). ALS are user-centered, and have the potential to revolutionize the way users interact with computers, overcoming many of the limitations of current systems.

However, the development and acceptance of agent based projects have been plagued with inconsistency and lack of grounded theoretical framework. A review of the literature also indicates that researchers have been complaining about the lack of these systems' use as practical tools for real world problems [Bradshaw, 1997; Hook 1996; Jennings et al., 1998; Maes, 1994; Nwana, 1996]. This dissertation agrees and identifies a domain that can significantly benefit from this technology.

IT Implementation Domain

In this study, the author posits that ALS hold the potential to facilitate the decision-making process regarding Information Technology (IT) implementation. The potential benefits that IT promises business entrepreneurs will compel them to make IT implementation decisions. The decision-making process poses many challenges. Simply acquiring the technology is not sufficient in realizing the returns on investment. It has been hypothesized that one of the reasons for the productivity paradox is that systems acquired are never used [Agarwal et al, 1998]. Failure to adopt IT or incorrect decisions regarding IT implementation can be detrimental to a business. In short, the decision to adopt IT is weighted, complex, challenging and risky. Business entrepreneurs are typically not well versed in IT implementation issues, even though they are ultimately responsible for the success of their business.

To facilitate the understanding of this process, previous IT research propose several models to explain technology acceptance. Technology acceptance has been the heart of research for many years. Most of the studies however, have primarily focused on the post-adoption phase of IT. The number of research centered on the pre-adoption process is very limited; there is a need for pre-adoption work. Tornatzky et al., [1982] stated research on prediction of innovation adoption would be much more valuable if the data regarding the perceived innovation characteristics were gathered to or at the same time as with the individual's decision to adopt or reject the innovation. This research intends to take a step towards that direction: it is focused on pre-adoption phase of IT implementation.

It extends the existing work on IT technology adoption. The Technology Acceptance Model [TAM], other technology acceptance research and Roger's [1983] innovation diffusion model postulate and empirically validate that perceptions are key determinants to one's decision regarding IT [Agarwal et al., 1998; Davis et al., 1989; Gefan et al, 1998; Harrison et al., 1997; Moore et al., 1991]. To date, several researchers have studied antecedents to the perceptions of the decision-maker's during IT implementation [Karahanna et al, 1999; Gefan et al, 1998; Agarwal et al, 1998, Igbaria et al, 1997; Iacovou et al, 1995]. These perceptions may vary based on the decision-maker. However, there is a lack of research on development as well as the effect of mediating influences to augment the decision-maker's perceptions [Karahanna et al, 1999; Gefan et al., 1998; Agarwal et al., 1998; Igbaria et al, 1997; Iacovou, 1995].

The IT decision-making environment is dynamic. Managers may not be equipped to adapt to the changes. ALS, as agents are capable of adapting to various environment and user preferences. Taking together, the major characteristic of ALS to autonomously adapt to various user preferences and different environments makes ALSTA an effective tool that may mediate the decision-maker's perceptions used in the decision-making process.

Earlier research indicates that any support tools that is developed for decision support should be adaptable to the user's preferences and habits [Agarwal, 1994; Chaung, 1998; El-Najdawi et al., 1993; Shaw, 1993]. ALS have the characteristics needed to develop tools that support business entrepreneurs during the IT

implementation decision-making process. They are flexible, self-adapting systems capable of accomplishing task on behalf of the user. Consequently, ALS can be used as tools for business entrepreneurs during the IT implementation decision-making process.

More specifically, this research will attempt to answer the following questions:
Will an adaptive learning system [ALS] assist the business entrepreneur in making more effective IT implementation decisions?
What is the framework for a support system to be utilized by business entrepreneurs in making IT decisions?

Theoretical Base

The research framework guiding this study combines aspects from innovation diffusion, technology acceptance model and modified TAMs to present an extension to TAM based on the mediating entity: an adaptive learning system. This research model concentrates on the process of IT implementation decision-making: pre-decision stage. Using Rogers's [1983] innovation-decision model as guide, the primary focus during this study would be on the persuasion stage of the decision-making process (see chapter 2). "*It is during that stage the secondary attributes about an innovation is formed. At the persuasion stage the individual becomes more psychological involved with the innovation; he or she actively seeks information about the new idea. Here the important behaviors are where he seeks the information, what messages he or she receives and how he or she interprets the information that is received. – it is at the persuasion stage that a general perception of the innovation is developed*" [Rogers, 1983].

TAM and other technology acceptance research concede that decisions regarding IT are a function of the decision-maker's perceptions of the IT [Davis et al., 1989, Moore et al., 1991, Rogers, 1983]. These research studies also concur that different decision-makers have varying perceptions of the same innovation. The more favorable an opinion that a decision-maker has regarding an innovation the most likely he/she will make a decision to adopt and ultimately implement that IT. For example, price is an attribute of technology. An individual perception of the price of a piece of software may vary based on his/her perception of the benefits he/her may derive from its use. Different individuals can have varying perceptions regarding a fixed attribute about a technology. It is the perception of the price of the software that may lead the individual to adopt the software and not the price itself. The individual perceptions may be different from the attribute but it can influence one's decision.

All IT decisions carry a degree of uncertainty for decision-makers that are unsure of the results. A decision-maker seeking to implement IT usually requires support/ reinforcement that his/her thinking regarding IT is correct. It is during this stage that the decision-maker tries to amass the required knowledge to reduce the uncertainty of the new technology. Rogers [1983] reported on the use of mass media and interpersonal channels for technological innovation diffusion. Reliance on the mass media for information is too general to define the advantages for the decision-maker [Rogers, 1983]. A more personalized channel of diffusion of IT is warranted.

Research Methodology

In a quest to examine the effectiveness of ALST to business entrepreneurs during IT decision-making, this research adopts a two-phase approach. Phase 1- Based on a review of the literature a conceptual model of the ALS was developed. The model incorporates theories from agent technology, decision support systems and IT implementation. The resulting model contains the following attributes: user-centered, proactive, adaptable, communicative, autonomous, flexible, responsive, learner-centered and knowledge base.

Phase 2: An ALS prototype based on the conceptual model will be developed, evaluated and validated. Evaluation of agent-based systems is by no means a simple task. This research will employ the methodology used by Davis to validate TAM and proposes to conduct a laboratory experiment. Anyone familiar with agent based systems will agree that research gaps exists for evaluation, and validation methods are not standardized. However, to test the usefulness of a system it is important to test it within the boundaries of its limitation [Vinze et al., 1991]. In this study, the researcher will test the effectiveness of an Adaptive Learning System Technology Advisor/Assistant *(henceforth referred to as ALSTA*) during the IT implementation decision-making process. The success of ALSTA will be measured by (1) the user's perception of the usefulness of ALSTA and (2) the degree to which ALSTA influenced the decision-maker's perceptions regarding their decision to implement the new IT. This approach was adopted from Sprague et al. [1982] who suggested that a DSS can be measured in terms of two systems (1) the DSS itself whose impact is to be evaluated and (2) the target on which the impact it was to be measured. The effectiveness of ALSTA as a DSS during IT implementation will be inferred by comparison of ALSTA with a non-adaptive DSS (NADSS) and a human consultant (HDSS).

Validation will follow steps outlined by Straub [1989] to ensure ALSTA is reliable and robust tool. The

results from this experiment are expected to prove that ALSTA will outperform a non-adaptive DSS and will perform at least as well as a human competent consultant. The constructs for measurement to be used during the experiment will be developed from prior empirically validated research.

Experiment Design

A 3X2 completely randomized experiment will be conducted. There are three variables with two-levels each: subjects will either be provided with ALSTA support, NADSS support or HDSS support [see figure 1].

The dependent variable for this research is defined in terms of two systems: (1) the decision support system: (the decision-maker's perception) and (2) the target system: the decision-maker's perceptions of the IT, pre-adopting the IT.

The constructs will be measured using two scales: perceived usefulness, perceived ease of use. In using this approach the researcher remains consistent with technology acceptance studies primarily TAM which utilizes perception measures.

	ALSTA	HDSS	NADSS
Technical users			
Non-technical users			

Figure 1: Experimental Design

Potential Data Analysis and Expected Benefits

The experiment is geared to measure the effectiveness of ALSTA in its role as a DSS during IT implementation. This is done by comparison with two additional DSS. The effectiveness of ALSTA will be measured with two dependent variables: ALSTA itself and its impact on the decision-maker's perceptions of the new technology. Once data is gathered an appropriate multiple comparison procedure will be employed to analyze the experimental data.

From this analysis the effectiveness of ALSTA as a DSS during IT implementation can be determined. ALSTA is expected to significantly outperform NADSS and perform at least as good as HDSS. Additionally, ALSTA is expected to be especially of greater value to non-technical than technical users during this process. This research is expected to be of value to researchers and practitioners engaging in projects on agents and IT implementation. It is also expected to have assist business entrepreneurs during their complex IT decision-making process.

Future work includes replicating this study in a fielded experiment as well as a longitudinal study.

References

References available upon request from author (Dessa_David@baruch.cuny.edu)